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Scapholunate interosseus ligament reconstruction on a cadaver: A technique

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Abstract

Introduction

Scapholunate (interosseus) ligament injuries can be treated through different surgical techniques, ranging from direct repair, tenodesis or bone-ligament-bone transfers. Other procedures such as partial arthrodesis or proximal row carpectomy are indicated when the original injury is complicated by osteoarthritis.[1,2]

Some attempts to recreate a ligamentous structure resembling the scapholunate interosseus ligament such as that proposed by Weiss,[3] Cuénod *et al*.[4] or recently by Corella *et al*.[5] have the potential disadvantage of modifying the articular surfaces of lunate and scaphoid which might lead to impingement onto the dorsal rim of distal radius and cartilage degeneration. These procedures only stabilize the dorsal aspect of the joint, leaving its proximal and palmar regions relatively unstable. These two segments of the ligament play also a relevant role as articular stabilizers.[6]

More widely used techniques such as three ligament tenodesis,[7] apart from establishing an indirect linkage where scaphoid and lunate cannot follow each other in a biomechanically optimal fashion, involve an important amount of local bone trauma (both mechanical and thermal), basically through drilling across the scaphoid waist that could jeopardize the osseous structure and its vascularity, leading to fracture or osteonecrosis.[8]

The technique presented in this article aims to stabilize the scapholunate joint through a long area resembling the scapholunate ligament while preserving most of its proximal, dorsal and volar articular surfaces. Moreover, the middle and distal thirds of the scaphoid are spared of mechanical and thermal trauma, which means that the vascularity and structural resistance are less disturbed.

Materials and Methods

A fresh frozen wrist cadaver specimen thawed to room temperature was used to carry out the procedure. Inspection of the scapholunate joint showed a healthy scapholunate interosseus ligament. It was severed to simulate a ligamentous lesion. Prior to cutting the ligament, the joint was stabilized by means of two transarticular Kirschner wires.

Technique

A dorsal approach to the wrist specimen is carried out in order to identify the scapholunate joint and ligament. The joint is stabilized using two transarticular Kirschner wires. These should be inserted as distally as possible to avoid interfering with the suture anchors. Prior to the insertion of the Kirschner wires the joint diastasis is reduced and both bones approximated as much as possible to prevent slackness of the plasty when the wires are removed. The joint space is exposed by excision of the remnants of the scapholunate ligament. Next, a 20 mm osteochondral groove along the dorsal, proximal and volar margins of the scapholunate joint is created using a U shaped chisel [Figure [Figure1a1a and andb].b]. This should be 6 mm wide and 4 mm deep and centered along the scapholunate joint space [Figure [Figure2a2a and andb].b]. The radiocarpal joint should be hyperflexed or even subluxed to reach the volar proximal aspect of the scapholunate joint.

A strip measuring 20 mm × 9 mm is harvested from the extensor retinaculum to recreate the scapholunate ligament. The strip should be harvested transversely and centered at the 4th compartment, where the retinaculum is the thickest.[9]

Six anchor sutures are inserted into the cancellous substance of lunate and scaphoid, three on each side of the groove at dorsal, proximal and volar levels [Figure 3]. Then the size of the strip is tested by placing it along the groove [Figure 4] and finally sutured onto it using the six anchor sutures [Figure [Figure5a5a–d]. The protruding edges of the strip are trimmed to avoid impingement onto the radiocarpal joint.

In an *in vivo* scenario, the wound should be closed by layers and a volar slab applied.

Discussion

Scapholunate ligament injuries are often missed or misdiagnosed because of relatively mild initial symptoms, ambiguous or difficult clinical examination and normal radiographs.[10] However, when patient's symptoms persist more than expected and further investigations such as magnetic resonance imaging or diagnostic arthroscopy are arranged, the ligament fibers may have already retracted or are partially degenerated, making direct repair technically difficult. Even if we manage a direct suture of the ligament, this can be weak and flimsy, which might eventually lead to long term complications, basically scapholunate advanced collapse (SLAC).

Once the ligamentous construction presented in this article has settled in an *in vivo* scenario, it offers the biomechanical advantage of resisting distraction, shear and torque forces at the scapholunate joint level. Furthermore, it creates a link or relationship between scaphoid and lunate that resembles the original ligament and its mechanism of action.

However, this being a cadaveric study, the osteointegration of the extensor retinaculum strip cannot be accomplished and for this reason it is difficult to consistently test the resistance of the ligamentous construction relying only on the fixation by anchors.

The technique is intended for stages I-IV of scapholunate dissociation, where complications secondary to abnormal wrist kinematics have not yet occurred and the carpal malalignement is still reducible. When static instability is established and the scaphoid is still reducible (stage IV), the carpal misalignment should always be reduced before the joint is stabilized with Kirschner wires.

In stages V and VI, with irreducible deformity or with established SLAC, the technique will not yield any benefit and more radical procedures are required.

More *in vivo* research is needed to validate its effectiveness in the long term.

Footnotes

Source of Support: Nil

Conflict of Interest: None

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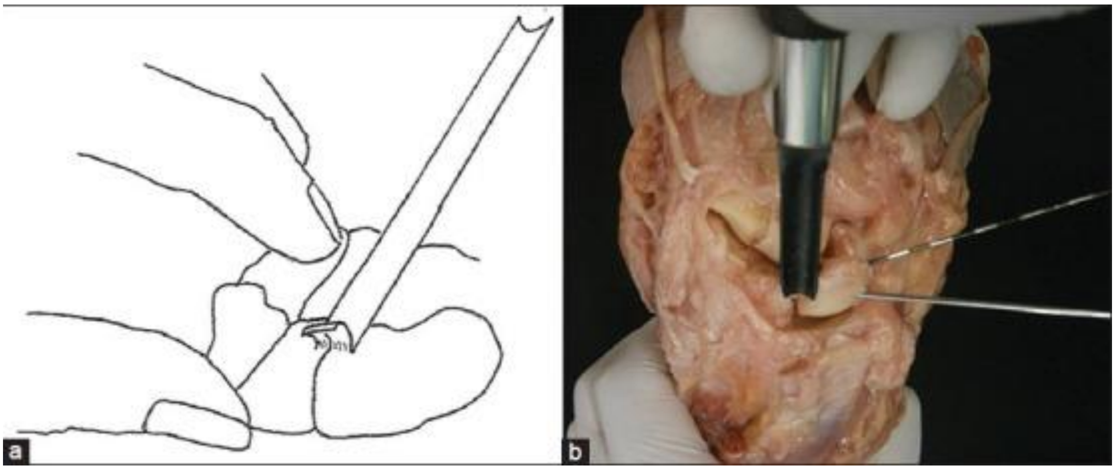
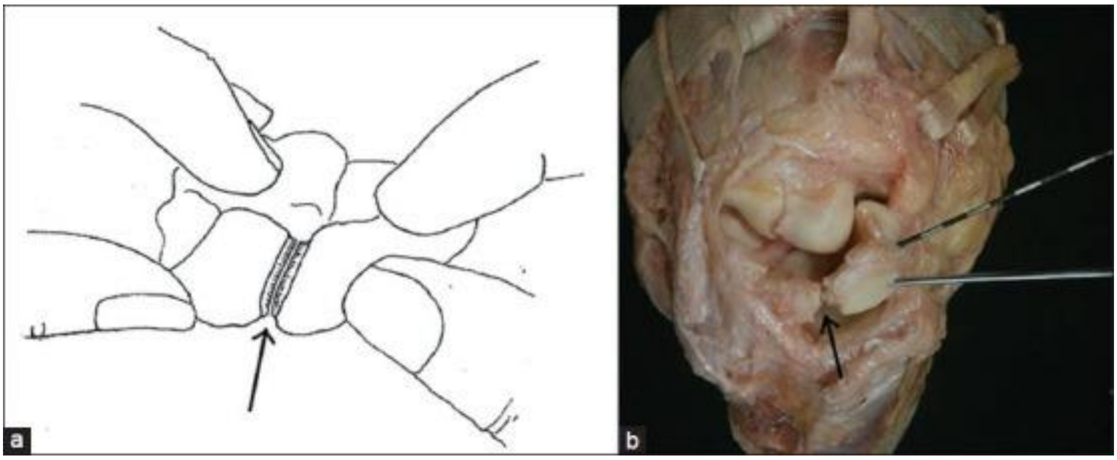
Figures and Tables

Figure 1



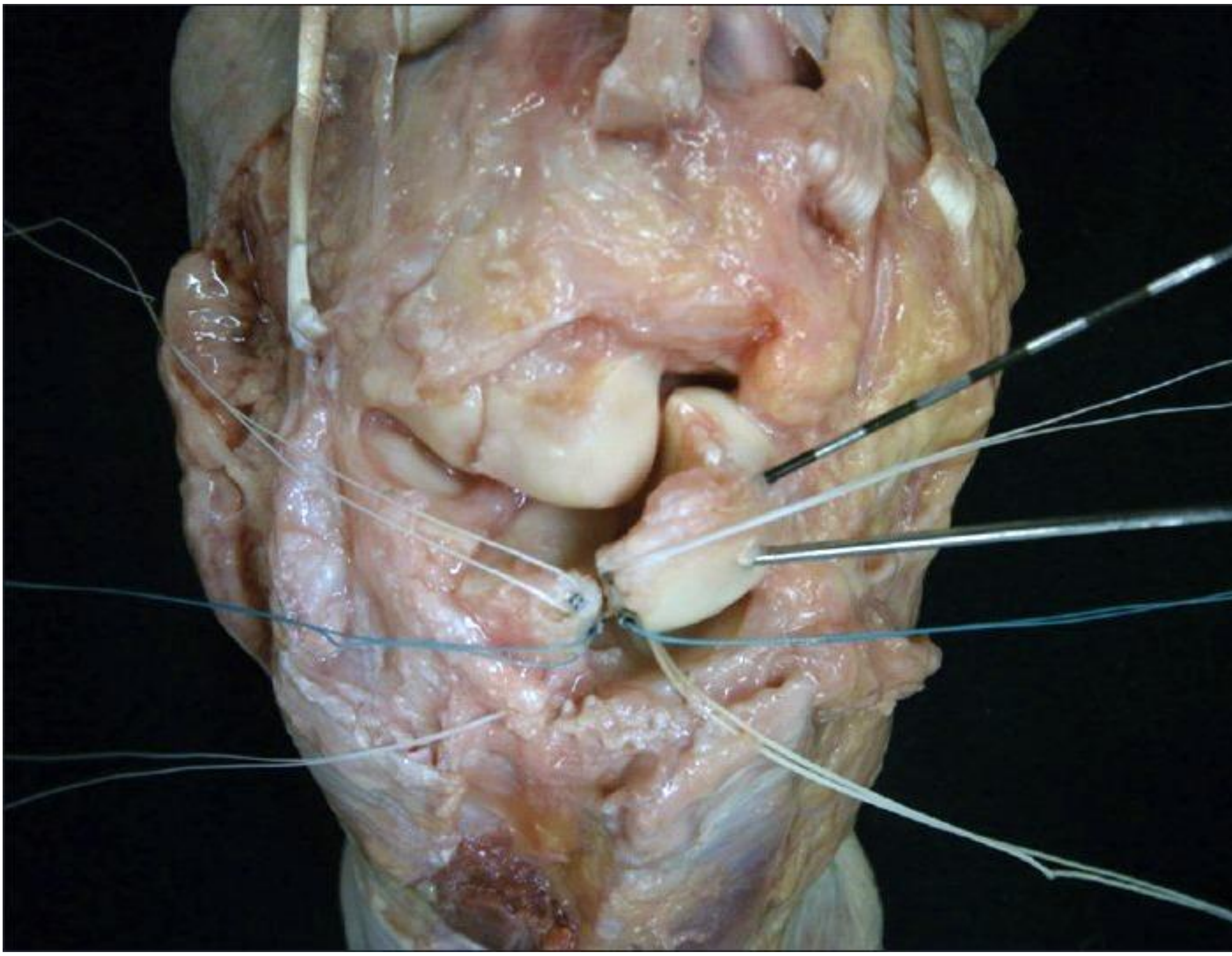
A line diagram and cadaveric dissection photograph (a and b) showing scapholunate joint exposed and U-chisel positioned to create an osteochondral groove

Figure 2



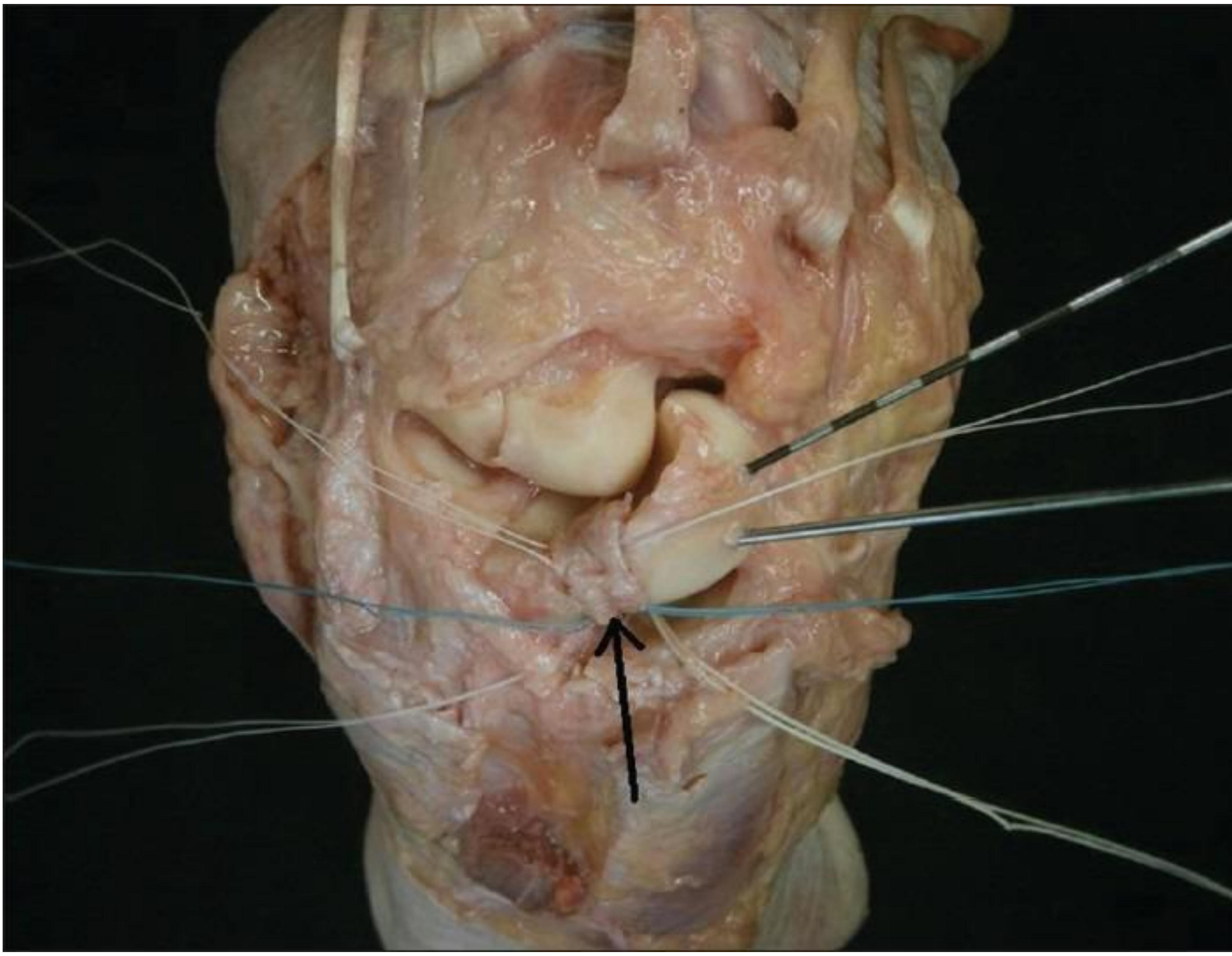
A line diagram and cadaveric dissection photograph showing (a and b) the osteochondral groove (arrow)

Figure 3



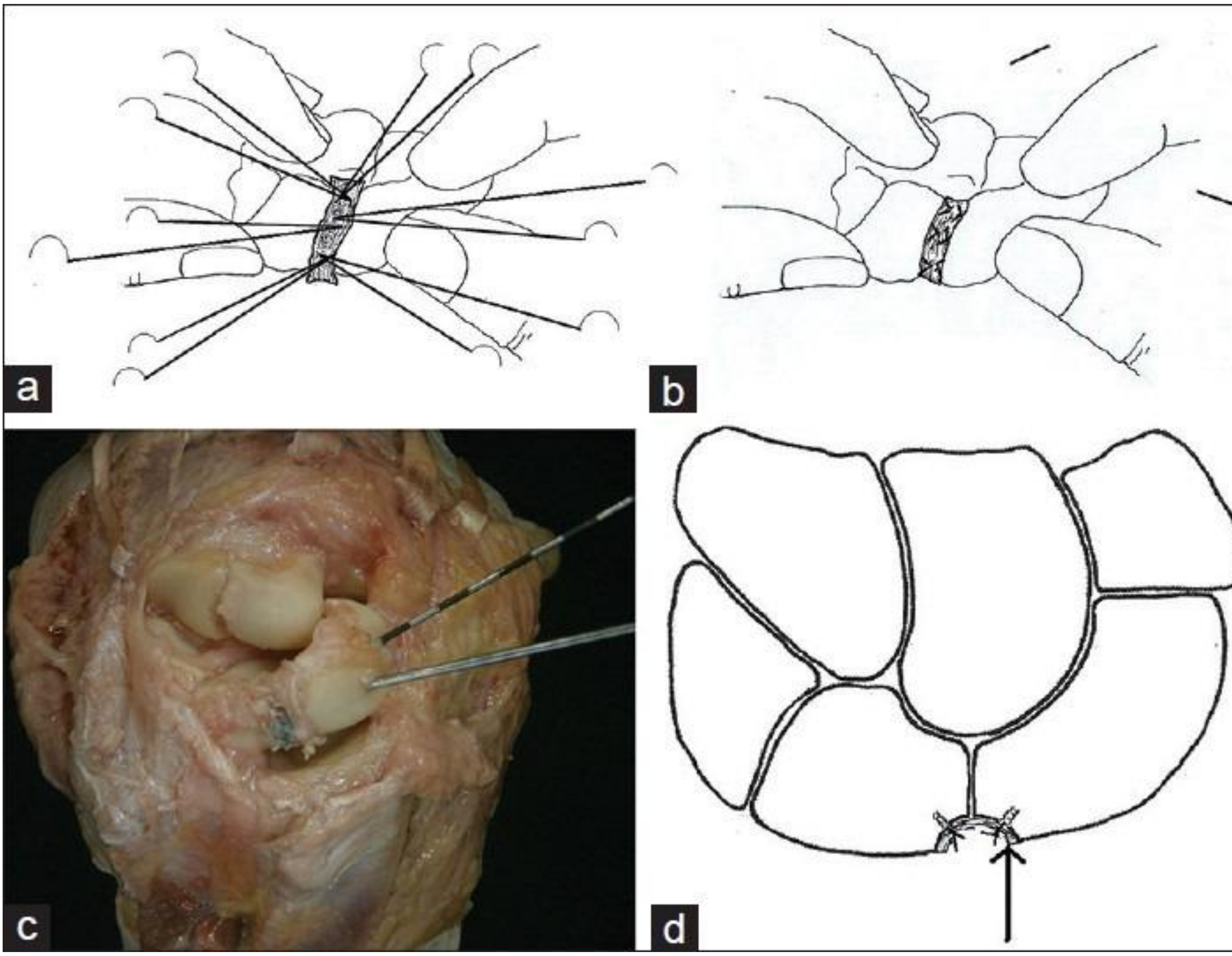
A cadaveric dissection photograph showing three anchor sutures inserted into each bone, aiming at the cancelous area of the wall of the groove

Figure 4



A cadaveric dissection photograph showing the strip of extensor retinaculum to check the correct size prior to suturing

Figure 5



A line diagram and cadaveric dissection photograph showing (a) Sutures have been already passed through the strip of extensor retinaculum. (b and c) Final result with the strip sutured onto the groove and its margins trimmed. (d) Coronal view of the plasty showing the strip of extensor retinaculum (arrowed) and two of the suture anchors

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